15.0 APPENDICES

Appendix I: Copy of Industrial Approval

NOVA SCOTIA
Department of Environment and Labour

APPROVAL

Province of Nova Scotia
***Environment Act*, S.N.S. 1994-95, c.1**

APPROVAL HOLDER:	**Shaw Resources**
APPROVAL NO:	**2004-043270**
EFFECTIVE DATE:	**October 14, 2004**
EXPIRY DATE:	**October 14, 2014**

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Construction and operation of a Sand Pit, and associated works, at or near Coldbrook, Kings County in the Province of Nova Scotia.

Administrator _____
Date Signed Nov 12/04

Appendix II: Lease Agreement - Lafarge Canada Inc and Shaw Group Limited

THIS NOTICE OF LEASE made this 20th day of August, 2004.

BETWEEN:

LAFARGE CANADA INC., a body corporate
hereinafter called the "Landlord"

OF THE ONE PART

- and -

THE SHAW GROUP LIMITED, a body corporate
hereinafter called the "Tenant"

OF THE OTHER PART

WHEREAS:

(a) The Landlord is the owner of the lands situate off Lovette Road, in the area of Coldbrook, in the County of Kings, in the Province of Nova Scotia, more particularly described in Schedule "A" and graphically shown in "Schedule B";

(b) By a certain indenture of lease (the "Lease") made as of the 28th day of May, 2004 the Landlord did lease to the Tenant the lands described in Schedule "A";

(c) The Landlord and Tenant have agreed to execute this Notice of Lease for registration purposes;

WITNESSES in consideration of the sum of One Dollar ($1.00) paid by the Tenant to the Landlord, the receipt whereof is hereby acknowledged and other good and valuable consideration as more fully described and set forth in the Lease, the Landlord has agreed to demise and lease and does hereby confirm its demise and lease to the Tenant and the Tenant has agreed to lease and take and does hereby confirm its lease and take (according to the terms of the Lease and governed by the limitations, restrictions and covenants therein contained) the lands situate off Lovette Road, in the area of Coldbrook, in the County of Kings, in the Province of Nova Scotia, more particularly described in Schedule "A" and graphically

shown in "Schedule B" attached subject to the obligations and covenants of the Tenant as contained in the Lease.

The term of the Lease is Ten (10) years commencing on the date of signing of the Lease and ending May 28th, 2014, thereafter unless such lease term shall terminate sooner under the provisions of the Lease. The Lease provides that at the end of the ten (10) year term of the Lease and thereafter from year to year the Lease shall be automatically renewed for a further term of one year.

The Lease provides that the Tenant shall have the exclusive right to drill for, extract, process, store, sell and remove aggregate from the lands during the term and all extensions.

It is understood that this Notice of Lease and the Lease made as of the 28th day of May, 2004, together constitute the entire Agreement between the parties and all terms of the Lease are incorporated herein by reference.

IN WITNESS WHEREOF the parties hereto have properly executed these presents on the day and year first above written.

SIGNED, SEALED AND DELIVERED in the presence of:

Kenneth Thimot

C. BAKER

LAFARGE CANADA INC.

Per: Gary Rudolph

Per:

THE SHAW GROUP LIMITED

Per: MICHAEL LANDRY SECRETARY

Per: RICHARD MILLER

Appendix III: Lease Agreement – Nova Scotia Limited and Shaw Group Limited

THIS NOTICE OF LEASE made this 5 day of Nov 2004.

BETWEEN:

3048483 NOVA SCOTIA LIMITED, a body corporate hereinafter called the "Landlord"

OF THE ONE PART

- and -

THE SHAW GROUP LIMITED, a body corporate hereinafter called the "Tenant"

OF THE OTHER PART

WHEREAS:

(a) The Landlord is the owner of the lands situated south of the 101 Highway and north and east of the adjacent lands of the Tenant, in the village of Coldbrook, Kings County, Nova Scotia. This parcel of land comprises approximately 50 acres (more or less) and includes a road and bridge situated on the Highway 101 Right of Way, connecting this parcel with the Lovett Road. This property and access road are shown highlighted on the attached Schedule "A". The access road, bridge and that portion of the 50-acre property actually required for the roads to facilitate vehicular access as outlined within this Notice of Lease agreement are herein called the "Lands";

KINGS COUNTY LAND REGISTRATION OFFICE
I certify that this document was registered as shown here.
Christine Dodge, Registrar
SH

76621029 — —
Document # Book Page(s)
11 09 2004 11:50
MM DD YYYY Time

(b) By a certain indenture of lease (the "Lease") made as of the 26th day of May, 2004 the Landlord did lease to the Tenant the Lands;

(c) The Landlord and Tenant have agreed to execute this Notice of Lease for registration purposes;

WITNESSES in consideration of the sum of One Dollar ($1.00) paid by the Tenant to the Landlord, the receipt whereof is hereby acknowledged and other good and valuable consideration as more fully described and set forth in the Lease, the Landlord has agreed to demise and lease and does hereby confirm its demise and lease to the Tenant and the Tenant has agreed to lease and take and does hereby confirm its lease and take (according to the terms of the Lease and governed by the limitations, restrictions and covenants therein contained) the Lands subject to the obligations and covenants of the Tenant as contained in the Lease.

1. The term of the Lease is Ten (10) years commencing on the date of signing of the Lease and ending May 26th, 2014 thereafter unless such lease term shall terminate sooner or be renewed under the provisions of the Lease. The Lease provides that at the end of the ten (10) year term of the Lease and thereafter from year to year the Lease shall be automatically renewed for a further term of one year.

2. The Lease provides that the Tenant shall have the right to enter upon the Lands for the purpose of trucking aggregate across the Lands, access road construction and maintenance and other activities related to the

intended purpose of trucking aggregate across the Lands and onto the adjacent property of the Tenant.

3. It is understood that this Notice of Lease and the Lease made as of the 26th day of May, 2004, together constitute the entire Agreement between the parties and all terms of the Lease are incorporated herein by reference.

IN WITNESS WHEREOF the parties hereto have properly executed these presents on the day and year first above written.

SIGNED, SEALED AND DELIVERED in the presence of:

THOMAS R. MacEWAN
A Barrister of the Supreme Court of Nova Scotia

3048483 NOVA SCOTIA LIMITED

Per: _____

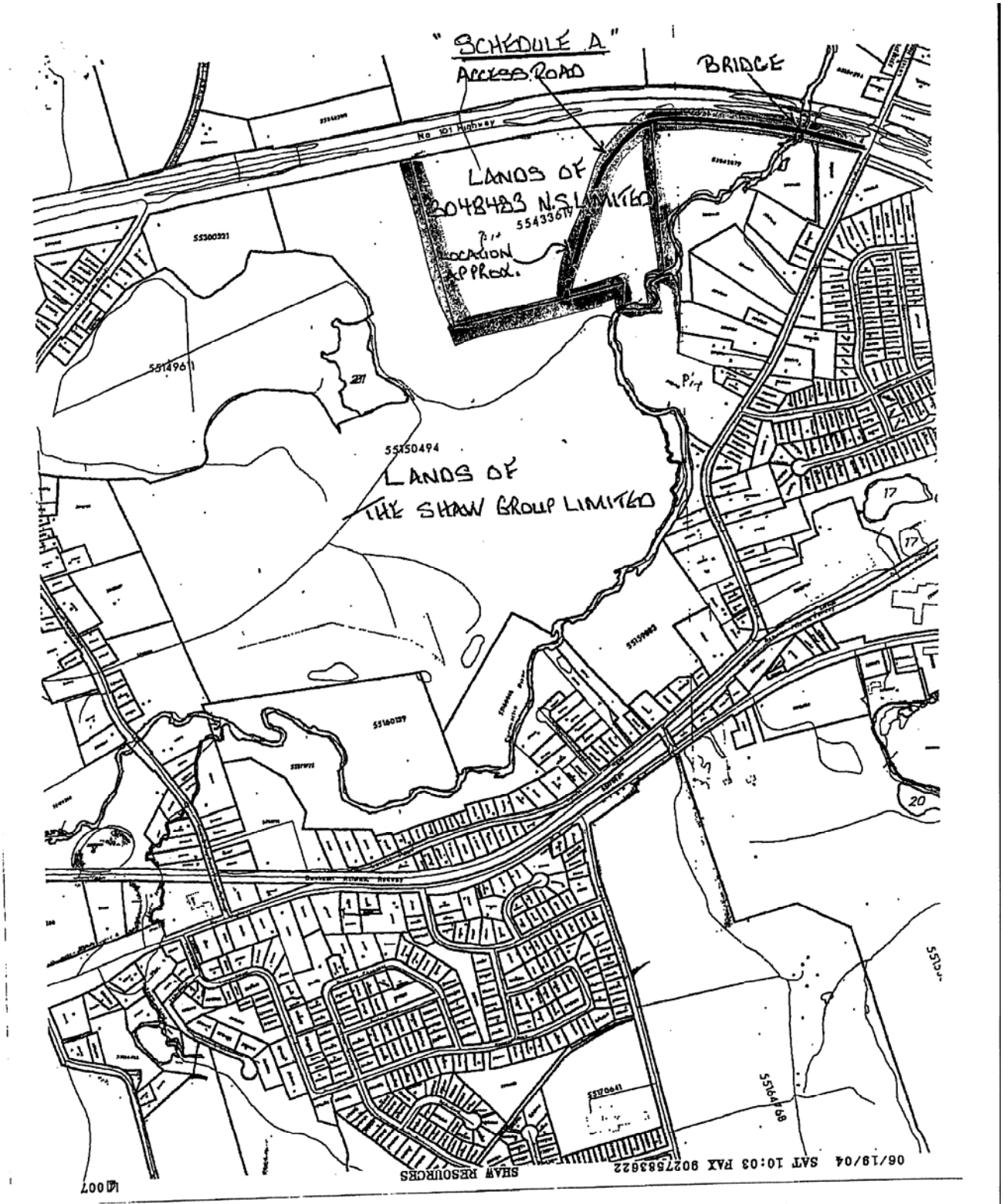
Per: _____

THE SHAW GROUP LIMITED

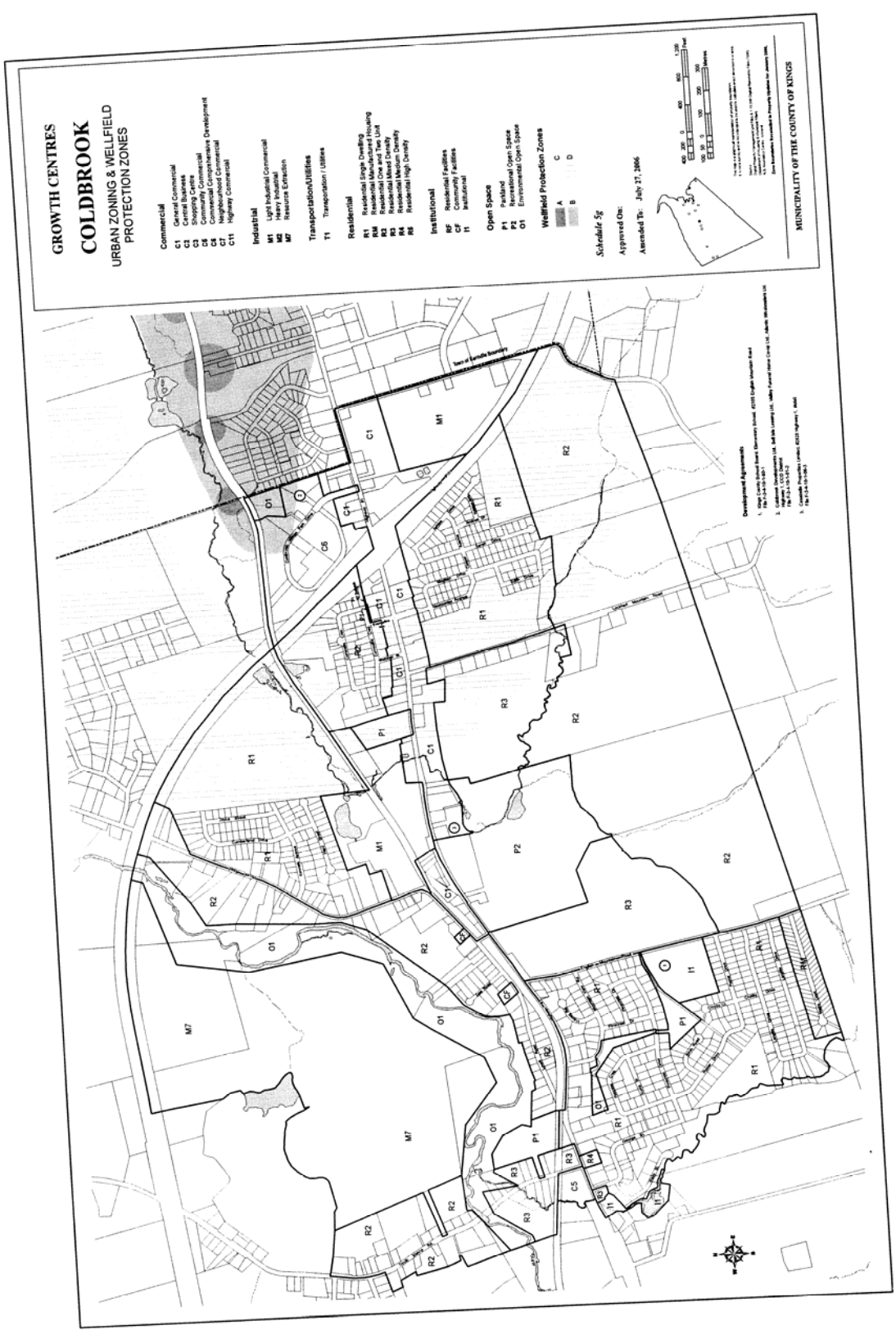
Per: _____

Per: _____
Bert Frizzell
President

Appendix IV: Diagram of Ells roadway and bridge



Appendix V: Diagram Kings County Growth Areas & Zoning



Appendix VI: Botanical Survey

Environmental Assessment

of

Shaw Resources – Lovett Road Site

Botanical Survey of a Shaw Resources Property Located on Lovett Road, Coldbrook, Kings County, Nova Scotia

Prepared for Shaw Resources

Prepared by Ruth E. Newell, B.Sc. (Hons.), M.Sc.

164 Schofield Road, Wolfville, NS, B4P 2R2

August 27th, 2006

Botanical Survey of a Shaw Resources Property located on Lovett Road, Coldbrook, Kings County, Nova Scotia

1.0 Introduction

A vascular plant survey of a property owned by Shaw Resources and located on Lovett Road, Coldbrook, Kings County, Nova Scotia was conducted by botanist, Ruth E. Newell, B.Sc. (Hons.), M.Sc. on the following dates: June 21st and August 19th, 2006. All habitats on site were visited two times over the growing season to ensure that both early and late season plants were documented. A small wetland adjacent to the property was also surveyed for species at risk.

Botanical nomenclature used in this report follows Roland (1998).

Prior to the conduction of fieldwork, an extensive list of priority/high potential species was developed based on information provided by the Atlantic Canada Conservation Data Centre and the Nova Scotia Museum of Natural History.

2.0 Results and Recommendations (Summary)

2.1 Rare Plant Species

1) There were no plant species listed by COSEWIC under the Federal Species-at-Risk Act (SARA, 2003) located on the proposed development site or in the adjacent wetland.
2) There were no plant species listed under the Nova Scotia Endangered Species Act (NSESA, 1999) located on the proposed development site or in the adjacent wetland.
3) There was one plant species of Conservation Concern as listed under the Nova Scotia General Status of Wild Species website (http://www.gov.ns.ca/natr/wildlife/genstatus/). Stout Wood Reed Grass (*Cinna arundinacea*) is a RED-listed species which means it is known to be or thought to be at risk. It was located in the small wetland situated immediately adjacent to the Shaw Resources property on its south side. This information is presented in TABLE 1 along with the ACCDC (Atlantic Canada Conservation Data Centre) provincial status ranking (http://www.accdc.com/info) for this species.

TABLE 1. Rare plant species located during this survey.

Scientific Name	Common Name	Provincial Color Status	ACCDC Status	Location
Cinna arundinacea	Stout Wood Reed Grass	Red	S1	scattered in small wetland adjacent to (south of) Shaw Resources property

2.2 Recommendations

Due to the presence of a Red-listed species in a small wetland adjacent to the Shaw Resources property on its south side, it is recommended that measures be taken during the property development to ensure that there is minimal impact on this wetland.

Besides the rare species listed above there were a number of other plant species present in this same wetland that although not listed as species at risk by federal or provincial legislation, and not considered as Red or Yellow species by the provincial Department of Natural Resources, are considered to be sensitive (uncommon) species by the ACCDC. These are, together with their provincial ranking by the ACCDC: Brome-like Sedge (*Carex bromoides*) (S3), Tall Hairy Agrimony (*Agrimonia gryposepala*) (S3?), False Pimpenel (*Lindernia dubia*) (S3S4) and Pennsylvania Smartweed (*Polygonum pensylvanicum*) (S3).

3.0 Report

3.1 General Habitat Descriptions

The property is composed primarily of two wooded ridges, one immediately south of an active sand extraction pit (not present in air photo below) and the other immediately north of the same pit. Both areas have similar vegetation with only minor differences. Figure 1 shows the general locations of the various habitat types.

Figure 1. Air photo of proposed development site showing location of wooded ridges and small wetland immediately south of the property. nr = north ridge, sr = south ridge, w = wetland

South Ridge

The dominant trees on the south ridge (Fig. 2) are Red Oak (*Quercus rubra*), Red Maple (*Acer rubrum*), White Pine (*Pinus strobus*) and Red Pine (*Pinus resinosa*). The understory is relatively open with thinly scattered shrubs, the most common of these being American Fly-honeysuckle (*Lonicera canadensis*), Common Lowbush Blueberry (*Vaccinium angustifolium*), Beaked Hazelnut (*Corylus cornuta*) and Sheep Laurel (*Kalmia angustifolia*). The most prominent herbaceous species present include: Partridge Berry (*Mitchella repens*), Teaberry (*Gaultheria procumbens*), Prince's Pine (*Chimaphila umbellata*), American Wintergreen (*Pyrola americana*), Wild Sarsaparilla (*Aralia nudicaulis*), Wild Lily-of-the-valley (*Maianthemum canadense*), Rice-grass (*Oryzopsis asperifolia*) and Bracken Fern (*Pteridium*

aquilinum). One plant of interest only because it was present in unusually high numbers was Pinesap (*Monotropa hypopithys*).

Figure 2. Woodland vegetation occurring on the south ridge of the property. In this view, Bracken Fern (*Pteridium aquilinum*) is quite prominent on the forest floor.

North Ridge

The north ridge (Fig. 3) is very similar to the south ridge in terms of plant species present with only minor differences. Here, there seems to be less Red Oak (*Quercus rubra*) and more Large-toothed Aspen (*Populus grandidentata*). Also, White Birch (*Betula papyrifera*) is more prominent along the north ridge than on the south ridge. Herbaceous vegetation is similar to that occurring on the south side of the property.

Figure 3. Woodland vegetation on the north ridge of the property. Bracken Fern (*Pteridium aquilinum*) can be seen on the forest floor

Wetland

The small wetland (Fig. 4) located immediately south of the proposed area of development is largely made up of an alder thicket. There is a small section of open meadow at its east end (where it abuts Hwy 101). There is a small stream flowing through the wetland.

Common species in the open meadow are Blue-joint Grass (*Calamagrostis canadensis*), Rice Cutgrass (*Leersia oryzoides*), Rough Goldenrod (*Solidago rugosa*), Spotted Touch-me-not (*Impatiens capensis*), Tear Thumb (*Polygonum sagittatum*), Large-leaved Avens (*Geum macrophyllum*) and Swamp Candle (*Lysimachia terrestris*).

The alder thicket is dominated by Speckled Alder (*Alnus incana*), Sensitive Fern (*Onoclea sensibilis*) and Spotted Touch-me-not (*Impatiens capensis*). A variety of other species occur here including: Large Enchanter's Nightshade (*Circaea lutetiana*), Jack-in-the-pulpit

(*Arisaema triphyllum*), Virginia Wild Rye (*Elymus virginicus*), Rough Bedstraw (*Galium asprellum*), etc.

Figure 4. A small wetland located south of the proposed development area. Open meadow can be seen in the foreground with Fringed Sedge (*Carex crinita*) and Blue- joint Grass (*Calamagrostis canadensis*). An alder thicket occurs in the background.

3.2 Rare Plants

3.2.1 Stout Wood Reed Grass (*Cinna arundinacea*)

Stout Wood Reed Grass is thinly distributed throughout the wetland although it seems to be most concentrated along the north side of the wetland under Speckled Alder (*Alnus incana*). There are signs of disturbance in this particular area caused by seasonal flooding and *light* ATV usage. This disturbance may benefit the plant by reducing competition from a number of the more aggressive plant species.

3.2.2 Species listed as uncommon by the ACCDC

As mentioned previously (Section 2.2), there were a number of other species present in the wetland that may not be of immediate conservation concern but do fall under the Atlantic Canada Conservation Data Centre's radar in terms of being sensitive (uncommon) species.

4.0 Bibliography

Roland, A.E. 1998. Roland's Flora of Nova Scotia. 3rd edition. Nimbus Publishing and the Nova Scotia Museum, Halifax, NS.

Appendix VII: Faunal Study

Environmental Assessment

of

Shaw Resources – Lovett Road Site

Terrestrial Vertebrate Faunal Analysis for a Proposed Aggregate Pit Expansion

Prepared for Shaw Resources

Prepared by George Allison, PhD, CWB

Wolfville, NS

2006

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11.0 APPENDICES

11.1 Appendix 1 – Common and scientific names of plants and animals cited in this report

11.2 Appendix 2 – Definitions of "species at risk"

11.2.1 Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

11.2.2 Nova Scotia Endangered Species Act

11.2.3 General Status of Wild Species in Nova Scotia

1.0 INTRODUCTION

Shaw Resources is applying to expand its aggregate extraction operations on a 7.1 ha property in the community of Coldbrook, Kings County, Nova Scotia. On behalf of the proponent, for inclusion in the Environmental Assessment Registration, the author has conducted an assessment of the use of this property by species of amphibians, reptiles, breeding birds and mammals considered at risk in Nova Scotia by the responsible federal and provincial agencies. Field studies were conducted between April and July, 2006. This report presents the findings of these studies.

Within this report all biological species are referred to by their common names. An alphabetic list of the common names of the species referred to in this report and their proper scientific names is presented in Appendix 1.

2.0 SUMMARY

A review of the terrestrial vertebrate species at risk that might occur in the Annapolis Valley Region and a comparison of their critical habitat requirements with the habitats available on or adjacent to the property suggested the possible use of these areas by one reptile (Wood Turtle), three breeding bird (Northern Goshawk, Long-eared Owl, Rusty Blackbird) and one mammal (Southern Flying Squirrel) species at risk. Studies were designed to confirm or deny the use of these areas by these species. The site was visited on six occasions between 29 April and 22 June, 2006, in the conduct of these studies.

Two surveys of the stream adjacent to the southeast boundary of the property were conducted during late April and early May in an attempt to observe Wood Turtles, that would have recently emerged from hibernation, basking along the stream banks. Three surveys were conducted of the inactive aggregate pit immediately west of the property during the nesting season (late May through June) to see if Wood Turtles were using this favourable nesting habitat. No Wood Turtles or signs of Wood Turtles were observed during either of these studies. I concluded that it is highly unlikely that Wood Turtles use seemingly appropriate habitats immediately adjacent to the property.

On 29 April a search for raptors, particularly Northern Goshawk and Long-eared Owl, and raptor nest structures was conducted on the property and areas immediately adjacent. On all subsequent visits to the property the presence or absence of raptorial bird species or their nests, was noted. No observations were made of these two raptor species at risk nor

were any potential new or old nest sites observed. I concluded that these species were not using the marginal habitats of this area for nesting and probably had not done so in the recent past.

On 7 June a survey for breeding perching birds was conducted on the property and along the stream adjacent to the southeast boundary of the property. No perching bird species at risk was observed during this dedicated survey or during the conduct of other surveys directed at other species at risk. It was concluded that the marginal nesting habitat for Rusty Blackbirds adjacent to this property was not being used by this species.

On 29 April a search of the property for potential tree nesting crevices for flying squirrels was unsuccessful in causing any flying squirrels to emerge from the few potential sites found. Similar searches done on an opportunistic basis during other studies were similarly unsuccessful. It was concluded on the basis of these observations, as well as the fact that potential Southern Flying Squirrel habitat on and immediately adjacent to this property is marginal, that it is unlikely that this species would be found here.

To meet its obligations under the Migratory Birds Convention Act, it is recommended that Shaw Resources should:

1) remove vegetation and overburden only during the time period when most migratory birds are not nesting (August through March);

2) not excavate embankments used by nesting birds during periods when their nests are active (May through July);

3) avoid, where possible, the nests of ground-nesting bird species that are

   sometimes attracted to extraction pits;

4) assure that toxic materials are not accessible to birds and that accidental spills of toxic materials are dealt with expeditiously using appropriate protocols.

Figure 1. The Shaw Resources property.

3.0 SITE DESCRIPTION

This 7.1 ha property is located on the floor of the Annapolis Valley in a small (<60 ha) forested area within the community of Coldbrook. The forested area is bisected by Highway 101 and surrounded by residential, commercial and agricultural development (Figure 1).

The property is bounded on the northeast by Highway 101 and on the southwest by a small (1.7 ha) aggregate pit. A small brook, a tributary of the Cornwallis River, flows northeasterly adjacent to the southern boundary of the property. The property terrain consists of two small hills, one occupying the northern half of the property and the other the south. A 2.2 ha portion of the property, which includes most of the southern hill, has been approved for aggregate extraction, was cleared in 2005 and is currently being excavated. The remainder of the property is forested.

3.1 Habitats

The forested portion of the property is quite homogeneous. Red Pine, White Pine, Red Maple and poplars (mainly Large-toothed Aspen) are the dominant tree species with Red Oaks being quite common. Other tree species observed on the property in small numbers were Paper Birch, American Beech, Red Spruce, White Spruce, Balsam Fir and Eastern Hemlock (only one specimen noted). The shrub layer is not well developed and consists of a scattering of Chokecherry, Beaked Hazelnut, Fly Honeysuckle, hawthorn and Alternate-leafed Dogwood (only one specimen noted). The ground layer is also quite sparse with blueberries, Partridge Berry, Bracken, Wintergreen, Prince's Pine and grass species being common elements.

The largest trees noted on the property were individual specimens of Red and White Pine that were approximately 53 cm dbh; however, these were the exception. In the remaining forest on the southern half of the property were several Red Oaks with dbh of between 25 and 43 cm (some with multiple trunks). Most trees of any species were <30 cm dbh. The forest contained little large-diameter standing deadwood. Crevices were noted mainly in a few poplars.

Just to the south of the property is the narrow floodplain of a small brook. Clay substrate is evident along portions of the brook and the floodplain soil is a silt loam that contrasts with the very sandy substrate of the Shaw Resources property. The floodplain is dominated by

alders, although Red Maples and willows are common tree species. Other tree species include White Spruce and American Elm with Black Cherry, wild apples and hawthorns occurring in some areas. There is a thick herbaceous layer consisting of grasses, sedges, ferns, Wild Cucumber, Jewelweed, etc.

The brook and floodplain are littered with plastic garbage; however, the steam itself seems to be quite clean, as is attested by the seemingly healthy population of Brook Trout that inhabit it.

3.2 Current Human Activity

As indicated above, the 2.2 ha portion of the property that has been approved for aggregate extraction has been cleared and aggregate is currently being extracted. An off-highway vehicle (OHV) trail passes through the "valley" between the two small hills on the property. The remains of several crude structures (presumably built by young people) and their furnishings are present on the property.

Adjacent to the property, Highway 101 is within 100 m of its northeastern boundary. The small aggregate pit at the western boundary of the Shaw Resources property appeared to have been inactive for some time. There was evidence of recreational use of this inactive pit by OHV's and the adjacent woodlands contain several OHV trails. The old Dominion Atlantic Railway (DAR) rail bed has had the tracks removed and is currently used as a hiking/biking/OHV trail. As mentioned previously, residential and commercial developments of the growing community of Coldbrook surround the forested enclave in which the Shaw Resources pit site is located.

4.0 SPECIES AT RISK

I have derived the following list (Table 1) of species at risk that are known or believed to occur within the Annapolis Valley region of Nova Scotia, the area within which the proposed development is located. I have defined the Annapolis Valley region to include the North (terrestrial areas only) and South Mountains as well as the Valley floor.

Species at risk have been identified from three priority lists:

1) Species listed as Endangered, Threatened or of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC);

2) Species listed as Endangered, Threatened or Vulnerable under the Nova Scotia Endangered Species Act;

3) Species assigned a status Red (At Risk or Maybe at Risk) or Yellow (Sensitive) under the General Status Ranks of Wild Species in Nova Scotia.

For a summary of the definitions used in deriving these priority lists, the reader is referred to Appendix 2.

Table 1. Species at risk that might be found in the Annapolis Valley region of Nova Scotia.

	Canadian Ranking	Nova Scotia Ranking	
	COSEWIC	Endangered Species Act	General Status
Amphibians			
Four-toed Salamander	-	-	yellow
Reptiles			
Wood Turtle	special concern	vulnerable	yellow
Breeding Birds			
Common Loon	not at risk	-	yellow
Northern Goshawk	not at risk	-	yellow
Peregrine Falcon	threatened	threatened	red
Common Tern	not at risk	-	yellow
Long-eared Owl	-	-	yellow
Short-eared Owl	special concern	-	yellow
Eastern Bluebird	not at risk	-	yellow
Vesper Sparrow	-	-	yellow
Nelson's Sharp-tailed Sparrow	not at risk	-	yellow
Bobolink	-	-	yellow
Eastern Meadowlark	-	-	yellow
Rusty Blackbird	special concern	-	green
Mammals			
Long-tailed Shrew	-	-	yellow
Little Brown Bat	-	-	yellow
Northern Long-eared Bat	-	-	yellow
Eastern Pipistrelle	-	-	yellow
Southern Flying Squirrel	not at risk	-	yellow
American Marten	-	endangered	red
Fisher	-	-	yellow
Moose	-	endangered	red

A review of the list of species at risk presented in Table 1 in the context of habitats available on or adjacent to the Shaw Resources property permits the elimination of a number of these as priority species because of lack of critical habitats as shown in Table 2.

Table 2. Species at risk that might be found in the Annapolis Valley region of Nova Scotia but lack critical habitat on or adjacent to the Shaw Resources property.

	Critical habitat not present on or adjacent to the property
Amphibians	
Four-toed Salamander	ponds or pools with sphagnum borders
Breeding Birds	
Common Loon	large lakes
Peregrine Falcon	cliffs
Common Tern	islands and sandy beaches in shallow lakes or large rivers
Short-eared Owl	open, grassy coastal areas
Eastern Bluebird	open areas with low vegetation and scattered nesting trees
Vesper Sparrow	open areas with short grass or low shrubs
Nelson's Sharp-tailed Sparrow	coastal marshes
Bobolink	large open grasslands or meadows
Eastern Meadowlark	large open grasslands
Mammals	
Long-tailed Shrew	talus slopes
Little Brown Bat	caves, buildings
Northern Long-eared Bat	caves, hollow shade tolerant hardwoods
Eastern Pipistrelle	rivers and lakes, caves
American Marten	large areas of mature softwood and mixed forests
Fisher	large areas of mixed forest
Moose	large areas of second-growth or intermediate forest interspersed with bogs, rivers and streams

A search of the Significant Species and Habitat database revealed no entries for the property; however, riparian areas along the nearby Cornwallis River were flagged as being habitat for species at risk. A check with Nova Scotia Department of Natural Resources (NSDNR) staff revealed that the terrestrial vertebrate species at risk that they thought might use these areas was the Wood Turtle. Since the brook that flows past the southern boundary of the property is a tributary of the Cornwallis River, if Wood Turtles use the Cornwallis River they might also use its tributaries.

Searches of the databases of the Atlantic Canada Conservation Data Centre (ACCDC) and the Nova Scotia Museum of Natural History, while providing no specific information for the property, indicated that, in addition to Wood Turtles, several bird species at risk had been recorded in the vicinity of the proposed pit expansion site. These included Northern Goshawk, Eastern Bluebird, Nelson's Sharp-tailed Sparrow and Bobolink. (Three additional bird species also reported in this general area, which are considered at risk only by the ACCDC but are not included on the three priority lists used in the design of this study, were Eastern Phoebe (S2S3B), Scarlet Tanager (S3B) and Northern Oriole (S3B).) As indicated in Table 2, suitable habitat for Eastern Bluebird, Nelson's Sharp-tailed Sparrow and Bobolink is not present on or adjacent to the property so these species have not been included on our priority list.

Potential nesting habitat for Northern Goshawk on or adjacent to this property would be at best marginal; however, this species has been included in our priority list because of its occurrence in the general area. While Long-eared Owls have not been reported from this general area, I have retained this species as a priority species since so very little is known of the distribution of this secretive, quiet, nocturnal bird that uses a number of habitats. The Rusty Blackbird is a very recent addition to the COSEWIC species at risk list and, although its primary nesting habitat is in spruce bogs and swamps, it is also known to nest in alder swales (Erskine, 1992). Although this species has not been reported in the immediate vicinity of the site and is noted for its preference of habitats "remote from human habitation" (Tufts, 1986), it has been retained on the priority list because of the alder swale habitat adjacent to the property.

Four mammal species at risk might possibly use the property or areas adjacent to the property. These include three bat species (Little Brown Bat, Northern Long-eared Bat and Eastern Pipistrelle) and the Southern Flying Squirrel. I consider it quite likely that Little Brown Bats and possibly Northern Long-eared Bats visit this property during their nocturnal foraging. It is remotely possible that the much less numerous and discontinuously distributed Eastern Pipistrelle, that forages mainly over rivers and lakes, might extend its foraging from more likely sites like the Cornwallis River into the tributary that skirts the southern boundary of this property. However, I have not identified any of these three bat species as being priority species since, while some may forage on the property, it is most unlikely that critical habitats (for maternity colonies and hiberniculae) would be found there.

Little Brown Bats are a generalist species associated with forests and human-dominated environments and are the most common bat species in Nova Scotia (Broders *et al.*, 2003). Critical habitats for this species are associated with maternity colonies where females rear their young and with hiberniculae where these mammals spend the winter months. Little Brown Bats hibernate in buildings where they can find an appropriate temperature regime or in caves; neither of these exist on this property. Although maternity colonies can be in tree cavities, female Little Brown Bats show a decided preference for buildings (Peterson, 1966; Schowalter *et al.*, 1979; Riskin and Pybus, 1998; Zimmerman and Glanz, 2000). No buildings are present on the property but there are many buildings in areas surrounding the property. Hollow trees suitable for maternity colonies are generally found in mature forests which would not describe the woodlands of this property.

Northern Long-eared Bats are a forest dwelling species and are the second most abundant bat species in Nova Scotia (Broders *et al*., 2003). Critical habitats for this species are also associated with maternal colonies and hiberniculae. Northern Long-eared Bats hibernate mainly in caves, which are not present on the property. Like Little Brown Bats, Northern Long-eared Bats can use either buildings or exfoliating bark or cavities in dead and dying trees. Unlike Little Brown Bats, Northern Long-eared Bats show a preference for the latter. Broders and Forbes (2004) reported that, in southern New Brunswick, Northern Long-eared Bats that had maternity colonies in tree cavities showed a marked preference for dead or dying shade tolerant hardwood trees in mature hardwood dominated stands. Since the immature mixed wood forest on the Shaw Resources property contains negligible numbers of dead or dying shade tolerant hardwoods (or softwoods), and only a few shade intolerant hardwoods that are showing signs of decay, it would seem unlikely that Northern Long-eared Bats would establish maternity colonies on this property, especially when areas of more mature hardwood dominated forest stands are present nearby (north of Highway 101).

Eastern Pipistrelles are the least numerous of the three resident bat species but can be locally common and typically forage over rivers and lakes (Broders *et al.*, 2003). The presence of this species in Kings County has only been confirmed along the Gaspereau River (Broders, 2004). Critical habitats for this species are also associated with maternity colonies and hiberniculae. Like the two *Myotis* bat species, Eastern Pipistrelles hibernate in caves and there are no caves on the property. In other parts of North America, maternity colonies have been found in buildings, tree foliage and rock crevices. It is currently thought that Eastern Pipistrelle maternity colonies are "often (hidden) inside a clump of dead leaves in an

otherwise healthy (deciduous) tree" (Kurta, 2001). Broders (2004) observed roosting colonies of Eastern Pipistrelles in Kejimkujic National Park using pendulous clumps of Old Man's Beard, in either deciduous or coniferous trees. There are neither rock crevices nor buildings on the property and the trees are not festooned with Old Man's Beard, although clumps of dead leaves would certainly be available. However, I believe that a combination of the lack of significant potential foraging habitat immediately adjacent to the property and the apparently very limited distribution of this species within the Annapolis Valley Region justifies its elimination from the priority list of species at risk.

Southern Flying Squirrels have been retained as a priority species since their presence has been confirmed at a site within 8 km of the property and the property does contain, albeit in very limited quantities, the elements that are believed to be essential to support Southern Flying Squirrels: seed-producing oak trees and trees containing cavities.

Our priority list of species is presented in Table 3 and contains five species: one reptile, three birds and one mammal. In the following sections I present the studies conducted, the results obtained and the conclusions reached regarding these priority species.

Table 3. Priority species at risk that might be found on or adjacent to the Shaw Resources property.

	Canadian Ranking	Nova Scotia Ranking	
	COSEWIC	Endangered Species Act	General Status
Reptiles			
Wood Turtle	special concern	vulnerable	yellow
Breeding Birds			
Northern Goshawk	not at risk	-	yellow
Long-eared Owl	-	-	yellow
Rusty Blackbird	special concern	-	green
Mammals			
Southern Flying Squirrel	not at risk	-	yellow

5.0 PERSONNEL AND TIMING

5.1 Personnel

Mr. Bernard Forsythe and I conducted field work for the preparation of this report. Mr. Forsythe is a well known and respected naturalist with special interests in birds and orchids. Mr. Forsythe has conducted studies and restoration work with raptors, particularly Barred Owls, for 30 years. In this study, he was involved in the bird censuses and the two Wood Turtle surveys conducted along the brook adjacent to the Shaw Resources property.

5.2 Timing

Wood Turtles are difficult animals to census; the best time to do so is soon after they have emerged from hibernation (mid-April to early May) when they spend considerable time on warm sunny days basking along the edges of streams at a time before the growth of vegetation compromises the observer's ability to see them.

Nesting by Wood Turtles can occur from late May through early July so potential nesting areas could be monitored during that time period.

Raptorial birds generally begin their nesting activities earlier than songbirds so it is desirable to conduct separate surveys for these two groups. Egg laying by both Long-eared Owl and Northern Goshawk begins in April, so the best time to search for nests of these species is between nest initiation and leaf out of the deciduous trees (mid-May).

Surveys of breeding perching birds are best conducted in late May or June after spring migration is complete and when most species have initiated nesting activities.

The Southern Flying Squirrel is a resident species that, because of its nocturnal and arboreal habits, is very difficult to survey. The species is active year round and hence can be surveyed at any time of year although in winter it tends to be less arboreal.

As part of this research, the property was visited six times. A listing of the dates, times, objectives and weather conditions experienced during these visits is presented in Table 4.

Table 4. Shaw Resources site visits, April - June, 2006.

Date (2006)	Observers	Main purpose of visit	Duration of visit From	Duration of visit To	Conditions Weather	Conditions Wind	Conditions Temp (°C)
29 April	WGA BLF + others	-reconnaissance of site -survey for raptorial birds -survey for flying squirrels	1300 h	1645 h	Cloudy	L	10
30 April	WGA BLF	-survey riparian habitat on stream for basking Wood Turtles	1000 h	1615 h	Hazy	C-L	10-16
5 May	WGA BLF	-survey riparian habitat on stream for basking Wood Turtles	1319 h	1556 h	Sunny with cloudy intervals	C-L	18-21
27 May	WGA	-survey inactive pit for sign of nesting Wood Turtles -check boundary markers	0920 h	1045 h	Cloudy	C-L	13-14
7 June	WGA BLF	-breeding perching bird survey -survey inactive pit for sign of nesting Wood Turtles	0512 h	0915 h	Cloudy	C-L	12-13
22 June	WGA	-survey inactive pit for sign of nesting Wood Turtles	1940 h	2030 h	Cloudy	L	25

Observers		Wind Code	Wind kph
WGA	George Alliston	C - Calm	0-5
BLF	Bernard Forsythe	L - Light	6-15

6.0 AMPHIBIANS AND REPTILES

6.1 Wood Turtles

6.1.1 Background

Wood Turtles are found in scattered, isolated populations throughout southeastern Canada (southern Ontario and Québec, New Brunswick and Nova Scotia) and the northeastern United States (south to Virginia and west to eastern Minnesota). Until recently it was thought that, in Nova Scotia, Wood Turtle populations were found only in the northeastern mainland and southwestern Cape Breton Island (Gilhen, 1984). The largest Wood Turtle

population in Nova Scotia (and perhaps in Canada) inhabits the watershed of the St. Marys River (Guysborough and Pictou Counties). This population, which could number as many as 2,000+, is believed to have declined during the past 40 years (Pulsifer *et al.*, 2004; Juurlink, 2005).

Only in recent years has the scientific community become aware of an apparently small isolated population of Wood Turtles on the upper Annapolis River and its tributaries. In 2005 NSDNR, with the assistance of the Clean Annapolis River Project (CARP), initiated a study of this population.

There have been only a few observations of Wood Turtles in the drainage of the Cornwallis River although one observation did occur in 2005 (L. Benjamin, *pers.comm.*) No systematic studies have been conducted for Wood Turtles in the Cornwallis River drainage and it is not known with certainty whether these observations represent a small natural population or are the result of releases of captive stock.

"Wood Turtles inhabit slow-moving, meandering intervale streams which have some sand and gravel banks for nesting and which often flow through prime agricultural land." (Gilhen, 1984). They hibernate, sometimes in groups (Harding and Bloomer, 1979; Pulsifer *et al.*, 2004), generally in deeper pools on the bottoms of streams and rivers away from the main current. In April or early May they leave their hibernation sites and move to the banks of the stream or river where, on sunny days in the late morning and afternoon, they bask for extended periods absorbing solar radiation to help in their thermoregulation. This behaviour can last for several weeks.

During the period from late May through early July, mature females seek out sand and gravel banks where they excavate a nest and lay their eggs. This process generally occurs over a period of about three hours and involves the digging of several "test holes". In some cases, this process can be repeated for several days before the eggs are finally laid and then covered with sand or gravel (Juurlink, 2005). The number of eggs laid by each female can vary from three to 13 with "normal" clutches being in the range of eight to ten (Brooks *et al*, 1992; Ernst *et al.*, 1994).

Eggs are incubated by heat from the sun and the incubation period in Nova Scotia is about 80 days but is variable depending upon weather and the microclimate of the nest site (Pulsifer *et al.*, 2004; Juurlink, 2005). Hatchlings generally emerge in September or October and make their way to streams where they overwinter.

The Wood Turtle is the most terrestrial of Nova Scotia's four native turtle species and, in summer, can range far from water. Wood Turtles are opportunistic omnivores feeding on a variety of plants, berries and invertebrates such as slugs and earthworms.

Wood Turtles are long-lived (to 50+ years) and late to become sexually mature (>10 years, (Harding and Bloomer, 1979)). Eggs and young Wood Turtles have high mortality rates and recruitment rates into the breeding population are low.

Wood Turtles are quite tolerant of human activity and can be quite adaptable. However, interactions with human activity that increase mortality rates in adults and/or decrease further the naturally low rates of recruitment into the breeding population make this species very vulnerable.

Wood Turtles may be at the greatest risk of any of Nova Scotia's turtle species even if they are the most widespread. With the notable exception of the St. Marys River population, populations are believed to be small and scattered, often inhabiting areas where they come in conflict with human activities, and there are no known populations inhabiting protected areas (Herman, 1997).

Wood Turtles are under protective legislation throughout their entire range. In 1996 Wood Turtles were listed as a species of Special Concern by COSEWIC. In 2000 they were listed as Vulnerable under the Nova Scotia Endangered Species Act and are given a Yellow (Sensitive) status in the General Status Ranks of Wild Species in Nova Scotia.

6.1.2 Study Objectives

The main objectives of the Wood Turtle study were:

1) to confirm the presence or absence of Wood Turtles using the brook adjacent to the southern boundary of the Shaw Resources property;

2) if present, to determine if Wood Turtles nest in the vicinity of the Shaw Resources pit.

6.1.3 Methods

To achieve objective 1) (above), two surveys of the riparian area along brook between Highway 1 and a beaver dam on the brook north of Highway 101 (see Figure 1) were conducted on foot between late April and early May, 2006. Observers walked along the brook parallel to the shoreline looking for basking Wood Turtles. Searches were conducted during the late morning and early afternoon of warm sunny days: times when Wood Turtles are most likely to be basking. Since these surveys were conducted before there was significant growth of herbaceous vegetation and prior to leaf out by deciduous trees and shrubs, a single observer could effectively search a zone at least 10 m inland from the shoreline. When two observers were present they proceeded in tandem on either side of the stream. When only one observer was searching, that observer searched one side of the stream while proceeding in one direction and returned searching the opposite side of the stream.

If Wood Turtles were using the brook adjacent the Shaw Resources property, it is possible that they might use the active Shaw pit or, more likely, the existing inactive pit (both are similar distances from the brook) for nesting during the period from late May through early July. The active pit would require constant monitoring to observe any Wood Turtle activity. In the adjacent inactive pit, tracks of turtles left in the sand would persist until extinguished by OHV activity or by rain. Given that the inactive pit had existed for a number of years and the site fidelity of nesting female Wood Turtles, monitoring this site would be a feasible proxy for the adjacent active Shaw Resources pit.

During the three site visits made in late May and June, a visual check was first made of the area to see if any Wood Turtles were present. If none was present, a search was made of all the exposed sand in the area to identify turtle tracks. Following completion of the survey of the proposed pit site the observers conducted a survey of the brook in the area adjacent to the southern boundary of the proposed pit site by proceeding together on a west to east course that followed within 10 m of the north bank of the brook (Figure !). Best efforts were made to avoid double counting of birds recorded during our circuit of the southern boundary of the proposed pit site.

6.1.4 Results

Surveys of the length of the brook as shown in Figure 1 were conducted on 30 April 2006 (1000 h to 1615 h) and 5 May 2006 (1319 h to 1556 h). During both surveys temperatures

were warm and the weather was either sunny with some cloudy periods (5 May) or somewhat hazy (30 April) (see Table 4). Since herbaceous vegetation was only beginning to emerge and the deciduous trees and shrubs had not leafed out, visibility was excellent. No Wood Turtles or turtle tracks were observed during these surveys. The only turtle observed during our work on this project was an Eastern Painted Turtle observed on 5 May basking in a pond south of the old DAR railway near Highway 101.

Although we found no evidence of basking Wood Turtles using the brook adjacent to the Shaw Resources property, we did conduct three surveys for nesting turtles in the inactive pit during late May and June, 2006, (see Table 5). During three visits to the site we were unsuccessful in seeing any turtles or finding any turtle tracks. While the bottom of this pit was of quite coarse texture and in many places would not have revealed turtle tracks, the embankments, in particular, were quite sandy and tracks would have been detectable in these areas. Although the weather in late May and June was rather rainy, the timing of these surveys was such that each survey for turtle tracks should have revealed tracks made in the previous two or three days and the 22 June 2006 survey could have revealed tracks made in the entire week prior to the visit (Table 5).

Table 5. Shaw Resources - Surveys of potential Wood Turtle nesting sites in inactive pit.

Date (2006)	Observers	Duration of visit From	To	Turtle Tracks	Last Significant Rainfall * (2006)	Comments
27 May	WGA	0920 h	1015 h	none	22 May (1.6 mm)	0.6 mm on 23 May
7 June	WGA BLF	0835 h	0915 h	none	4 June (32 mm)	0.7 mm on 5 June
22 June	WGA	1940 h	2030 h	none	15 June (35 mm)	0.6 mm on 19 June and 20 June

Observers

WGA George Alliston
BLF Bernard Forsythe

* Significant Rainfall defined as > 1 mm.
Weather statistics from Environment Canada - observed at Kentville AAFC, N.S.

6.1.5 Discussion and Conclusions

While the brook appeared to offer potential habitat for Wood Turtles, the clay bottom observed in several locations would not provide optimal hibernation sites. Sites that might provide better hibernation habitat (larger ponds where current is slower) were found downstream from Highway 101. The culvert under Highway 101 is constructed in such a manner that it would not permit passage of turtles attempting to move upstream. Passage would have to be achieved either by crossing Highway 101 or taking a detour via the old DAR underpass. The hazards to turtles of crossing Highway 101 are evident.

Our investigation revealed no indication of use of habitats on or adjacent to the Shaw Resources property by Wood Turtles. Should Wood Turtles ever have used this area, such use may have been compromised by events that occurred several decades ago.

6.2 Other Amphibians and Reptiles

Other than the studies directed at finding Wood Turtles, all observations of reptiles and amphibians were made opportunistically during the conduct of other studies. The only reptile species observed was an Eastern Painted Turtle (see above). Only three species of amphibians were recorded: Spring Peeper, Green Frog and American Toad.

7.0 BREEDING BIRDS

7.1 Breeding Bird Surveys

7.1.1 Objective

The primary objective of the surveys was to confirm the presence of any breeding bird species at risk and, in particular, the priority species identified above, on or adjacent to the Shaw Resources pit site.

7.1.2 Raptorial Birds

7.1.2.1 Background

The two raptor species identified in our priority list are the Northern Goshawk and the Long-eared Owl. Critical habitat for these species would be associated with the nest site.

Northern Goshawks are inhabitants of forested areas where they hunt both birds and mammals. These migrant birds may return from their wintering areas as early as February. They generally return year after year to the same area where they build their nests, generally in the lower branches of trees not more than 10 m from the ground. "Heavy, old-growth hardwoods are most favoured at nesting time, but nests may be found in woods of mixed growth." (Tufts, 1986). Nesting birds, over a period of years, may use several nest sites within the confines of their preferred nesting habitat. Nest building or rebuilding may start in March but egg-laying does not normally begin until early April. Nesting Goshawks are generally very aggressive and vocal in protecting their nest sites. They have very large home ranges that can exceed 2,000 ha.

The Long-eared Owl is a resident species that, "Seldom, perhaps never, builds its own nest." Eggs are usually laid in an old American Crow, Common Raven or hawk nest or on top of a "witches broom". "Nests are located in thick evergreen woods, usually if not always near the edge of a cleared space" (Tufts, 1986). "It frequents woodlands large or small, dense or open, conifer or broad-leafed, at all seasons, but it also forages over open areas" (Erskine, 1992). Long-eared Owls are a secretive, quiet and strictly nocturnal species that feeds almost exclusively on small rodents and roost during the day in dense cover.

7.1.2.2 Methods

A survey directed specifically at identifying the nests of any raptorial bird species at risk, particularly Northern Goshawk and Long-eared Owl, was conducted during the afternoon (1419 h to1645 h) of 29 April 2006. At this time of year these species would be attending their nests; however, leaves had not yet developed on the deciduous trees reducing the difficulty of finding nest structures. If a nest structure was found it was observed for activity and, if none was observed, the area under the nest was checked for fresh fecal material, feathers, and pellets. If these actions did not reveal the presence and identity of the potential occupant, where possible the tree would be climbed and the nest contents examined. The location of any nest sites would be recorded using a global positioning system (Garmin GPS76).

Mr. Forsythe and I walked the woodlands of the property and forested areas immediately adjacent looking for raptors or their nests as well as the nests of American Crows and Common Ravens. Since the property is small, the entire property was surveyed.

In addition to the official raptor survey on 29 April, during all subsequent visits to the site observations of the presence of raptors and their nests or the nests of American Crows and Common Ravens were noted. During this survey the two observers proceeded along parallel paths spaced approximately 30 m apart. The survey was begun with a clockwise circuit of the property centred on the boundary (Figure 1) followed by a criss-crossing of the interior forested portions of the property until the entire forested area of the property had been searched.

7.1.2.3 Results and Discussion

No observations were made during this study of Long-eared Owls, Northern Goshawks or their nests or nests of American Crows or Common Ravens. Indeed no raptorial birds of any species were observed during our six visits to this property.

While it is possible that this area might be part of the home range of either Long-eared Owls or Northern Goshawks, our lack of observation of the birds and our inability to, under favourable survey conditions, find any nest structures, would suggest that neither of these species currently or in the recent past has nested on or immediately adjacent to the Shaw Resources property.

7.1.3 Perching Birds

7.1.3.1 Background

The only perching bird identified on our breeding bird species-at-risk priority list is the Rusty Blackbird. Critical habitat for this species would be associated with its nest site.

Nova Scotia is at the southern extremity of the breeding range of this species. Significant declines in the numbers of breeding Rusty Blackbirds are believed to have occurred in its southern range during recent decades and "forecasts of global warming may imply further declines" (Erskine, 1992). During the breeding season it frequents cool habitats in spruce bogs, swamps and damp alder swales (Erskine, 1992), more often in the interior than along the coast, and, as a rule, somewhat remote from human habitation (Tufts, 1986). This bird generally arrives from its wintering areas in mid- to late March and egg-laying begins during the first week of May.

7.1.3.2 Methods

Since breeding perching birds are most readily identified by their songs or calls, and peak singing by territorial birds usually occurs in the early morning, the breeding bird survey was begun just before sunrise. The survey date was chosen when the weather was neither rainy nor windy (7 June 2006), both of which could result in a decrease in bird songs and impede our ability to hear these songs. During this survey the two observers proceeded together following the boundary line of the property beginning at the entrance road to the active pit site and proceeding clockwise around the property (Figure 1). To assure that no bird species occupying the interior of the property were missed, upon completion of the boundary circuit, the observers proceeded in a west to east direction following a course across the centre of the property immediately north of the access road and active pit site (Figure 1). No additional bird species were recorded during this portion of the survey.

Two observers, Bernard Forsythe and I, conducted the survey. Both observers were equipped with 10x binoculars. A GPS was available to record the positions were any species at risk was observed. Although no priority species at risk had been identified for the Shaw Resources property itself, a survey of the property was completed by traversing its boundaries (0512 h to 0653 h) and recording all birds seen or heard. A survey was also conducted along the brook adjacent to the property (0720 h to 0818 h) where, if present, Rusty Blackbirds might be expected to be found.

In addition to the official breeding bird survey conducted on 7 June 2006, bird observations were noted on each visit to the property and adjacent areas.

7.1.3.3 Results and Discussion

Table 6 presents the results of our 7 June 2006 survey of the property and also includes any observations of bird species not recorded on 7 June made during other site visits if the sighting was made during the normal nesting period of that species.

No perching bird species at risk were observed during any of our visits to the property and adjacent areas. We had identified only one priority species at risk, the Rusty Blackbird, that might find some appropriate habitat within the area of influence of pit activities: i.e. in the alder swales along the brook adjacent to the property. On our official breeding bird survey as well as the more extensive surveys conducted in this habitat for basking Wood Turtles (30 April 2006 and 5 May 2006), no Rusty Blackbirds were found.

A single species considered at risk by ACCDC, but not on the priority lists used in this study, was found during our studies. An Eastern Phoebe was observed on 5 May 2006 at the western extremity of the area searched for basking Wood Turtles. The bird was found near the east side of the Scotian Gold Co-operative complex where a small bridge crosses the brook (N45° 04.79', W64° 34.541'). It is believed that this bird may have been attempting to nest under the bridge; however, water levels were too high at the time to be able to confirm this. Eastern Phoebes have been previously recorded nesting in this location (Harold Forsyth, *pers. comm*.) This site is approximately 0.6 km from the Shaw Resources pit and well beyond its area of influence.

Table 6. Shaw Resources - breeding bird survey - 7 June 2006.

	Proposed Pit Site	Along Adjacent Brook	Total
American Black Duck *		3	3
Ring-necked Pheasant	1		1
Ruffed Grouse **		1	1
Herring Gull	1		1
Mourning Dove	6		6
Belted Kingfisher		1	1
Northern Flicker		1	1
Eastern Wood-Pewee	9		9
Least Flycatcher	7		7
Eastern Phoebe **		1	1
Blue-headed Vireo	1		1
Red-eyed Vireo	11	1	12
Blue Jay	2		2
American Crow	7		7
Black-capped Chickadee	8		8
Red-breasted Nuthatch	1		1
White-breasted Nuthatch ø	2		2
Brown Creeper	4		4
Veery	1	6	7
Hermit Thrush	8		8
American Robin	20		20
Cedar Waxwing	1		1
Northern Parula	2		2
Yellow Warbler		1	1
Chestnut-sided Warbler	2	2	4
Yellow-rumped Warbler	3		3
Black-throated Green Warbler	6		6
Black-and-white Warbler	1	1	2
American Redstart	2	9	11
Ovenbird	26		26
Common Yellowthroat		1	1
Song Sparrow	4	2	6
Dark-eyed Junco	19		19
Rose-breasted Grosbeak	1	1	2
Common Grackle		1	1
Purple Finch	3	1	4
American Goldfinch	4		4
TOTAL	**163**	**33**	**196**

* seen on 30 April 2006
** seen on 5 May 2006
ø seen on 27 May 2006

8.0 MAMMALS

8.1 Southern Flying Squirrels

8.1.1 Background

Until the mid 1980's, when Mark Elderkin found them in Kings County, the Nova Scotia population of Southern Flying Squirrels was believed to be confined to Kejimkujik National Park. More recent work by Amanda Lavers (2004) has revealed that this species is more widespread in southwestern Nova Scotia than previously thought. In April 2006 COSEWIC reassessed the status of the Nova Scotia population of Southern Flying Squirrels and reclassified them from Special Concern to Not At Risk. The Province of Nova Scotia has, to date, retained the Yellow (sensitive) colour ranking for this species.

Southern Flying Squirrels are a highly arboreal, nocturnal species that is active throughout the year and highly social, particularly in winter when many individuals can share the same nest site. These nest sites can also be shared with the closely related Northern Flying Squirrel. Although the diet of Southern Flying Squirrels consists largely of seeds, they also consume quantities of fungi and are carnivorous, consuming insects, birds eggs and nestlings, and carrion.

Two major habitat elements required by the Nova Scotia populations appear to be presence of seed producing oak trees to provide a basic food source and tree cavities to provide shelter, although they do occasionally use drays. Cavity nests are found in snags and trees with dead or dying branches, natural cavities or cavities created by small woodpeckers. Such tree cavities are generally found in older forests.

8.1.2 Methods

Their strictly nocturnal and arboreal habits make Southern Flying Squirrels very difficult to detect. In an attempt to detect the presence of flying squirrels of either species, during our 29 April 2006 survey of the property for raptor nest sites, any trees with visible cavities were rapped repeatedly with a stick by one of the surveyors while the other observed the cavity openings for the appearance of squirrels. While this was done for the entire property and some areas immediately adjacent on 29 April, a similar procedure was followed when trees with cavities were encountered opportunistically during other aspects of this study.

8.1.3 Results and Discussion

Our efforts at rapping on trees with cavities produced no observations of flying squirrels. While this methodology is admittedly crude, a more sophisticated approach would require baiting and the use of motion, heat, contact or light beam interruption activated night photography. These methods would likely be more effective in winter when food is less abundant and the squirrels are less arboreal.

Given that acorn producing Red Oaks on the property are confined to the narrow strip of forest extending from the entrance to the active pit site along the southeast boundary of the property, and that this forest is not mature and trees with cavities are comparatively rare (confined mainly to a few poplars), I believe that it is quite unlikely that Southern Flying Squirrels would be found using this area even with the use of more sophisticated monitoring techniques.

8.2 Other Mammal Species

Seven mammal species or their sign were observed opportunistically during the conduct of these studies (see Table 7). Considerable American Beaver activity was noted along the brook, particularly north of Highway 101, and a Beaver dam spanned the brook north of Highway 101 (N45° 4.423'; W64° 33.893') at the northeastern extremity of the riparian area searched for Wood Turtles (Figure 1).

Table 7. Mammals and mammal sign recorded on or adjacent to the Shaw Resources property - April - June, 2006.

	Observed	Heard / Sign
Varying Hare	√	√
Eastern Chipmunk	√	√
American Beaver		√
Common Muskrat		√
Raccoon		√
Striped Skunk		√
White-tailed Deer	√	√

9.0 MIGRATORY BIRDS CONVENTION ACT (1994)

While the Migratory Birds Convention Act (1994) deals mainly with regulations concerning the hunting, capture and possession of migrating birds and their eggs and nests, it also applies to situations where "nests may be damaged, destroyed, removed or disturbed". To meet these obligations under this Act, it is recommended that Shaw Resources. should:

1) remove vegetation and overburden, and the wildlife and bird nesting habitat it supports, only during the time period when migratory birds do not normally nest (August through March);

2) not remove sand from embankments used for nesting by such species as the Belted Kingfisher and Bank Swallow during periods when their nests are active (May through July);

3) avoid, where possible, the nests of ground-nesting birds species that are sometimes attracted to extraction pits (e.g. Killdeer, Spotted Sandpiper, Common Nighthawk);

4) assure that all toxic materials that might be used in the pit operations (e.g. gasoline, diesel fuel, engine oil, hydraulic fluid, antifreeze, etc.) are not accessible to birds and other wildlife. Any accidental spills of toxic materials should be dealt with expeditiously using appropriate protocols.

10.0 SOURCES OF INFORMATION

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COSEWIC – http://www.cosewic.gc.ca

COSEWIC – Species Assessment - http://www.cosewic.gc.ca/en/sct0/index_e.cfm

Department of Justice, Canada – Migratory Birds Convention Act, 1994

http://laws.justice.gc.ca/en/M-7.01/text.html

Environment Canada – Species at Risk - http://www.speciesatrisk.gc.ca/

Environment Canada – Wild Spaces - http://www.on.ec.gc.ca/wildlife/wildspace/

Government of Nova Scotia – Endangered Species Act

http://www.gov.ns.ca/legislature/legc/statutes/endspec.htm

Nature Serve – http://www.natureserve.org

Nova Scotia Department of Natural Resources – Endangered Species List

http://www.gov.ns.ca/natr/wildlife/endngrd/specieslist.htm

Nova Scotia Department of Natural Resources -

General Status Ranks of Wild Species in Nova Scotia -
http://www.gov.ns.ca/natr/wildlife/genstatus/

Nova Scotia Department of Natural Resources -

Significant Species and Habitat Database -

http://www.gov.ns.ca/natr/wildlife/Thp/disclaim.htm

Nova Scotia Museum of Natural History - http://museum.gov.ns.ca/mnh/

University of Michigan, Museum of Zoology - http://www.ummz.lsa.umich.edu/

U.S. Forestry Service - http://www.fs.fed.us/database/feis/

WoodTurtle.com – http://www.woodturtle.com

11.0 APPENDICES

11.1 Appendix 1 – Common and scientific names of plants and animals cited in this report

Plants	
Common Name	**Scientific Name**
Alders	*Alnus spp.*
Alternate-leafed Dogwood	*Cornus alternifolia*
American Beech	*Fagus grandifolia*
American Elm	*Ulmus Americana*
Apple	*Malus spp.*
Balsam Fir	*Abies balsamea*
Beaked Hazelnut	*Corylus comuta*
Black Cherry	*Prunus serotina*
Blueberries	*Vaccinium spp.*
Bracken	*Pteridium equilinum*
Chokecherry	*Prunus virginiana*
Eastern Hemlock	*Tsuga cnadensis*
Ferns	Order *Filicales*
Fly Honeysuckle	*Lonicera oblongifolia*
Grasses	*Graminaceae spp.*
Hawthorns	*Crataegus spp.*
Jewelweeds	*Impatiens spp.*
Large-toothed Aspen	*Populus grandidentata*
Paper Birch	*Betula papyrifera*
Partridge Berry	*Mitchella repens*
Poplar species	*Populus spp.*
Prince's Pine	*Chimaphila umbellata*
Red Maple	*Acer rubrum*
Red Oak	*Quercus rubra*
Red Pine	*Pinus resinosa*
Red Spruce	*Picea rubens*
Sedges	*Carex spp.*
White Pine	*Pinus strobus*
White Spruce	*Picea glauca*
Wild Cucumber	*Echinocystis lobata*
Willows	*Salix spp.*
Wintergreen	*Gaultheria procumbens*

Lichens	
Common Name	**Scientific Name**
Old Man's Beard	*Usnea spp.*

Invertebrates	
Common Name	**Scientific Name**
Earthworm	*Lumbricus spp.*
Slug	*Deroceras spp.*

Fish	
Common Name	**Scientific Name**
Brook Trout	*Salvelinus fontinalis*

Amphibians	
Common Name	**Scientific Name**
Common Toad	*Bufo americanus*
Four-toed Salamander	*Hemidactylium scutatum*
Green Frog	*Rana clamitans*
Spring Peeper	*Pseudacris crucifer*

Reptiles	
Common Name	**Scientific Name**
Blanding's Turtle	*Emydoidea blandingi*
Eastern Painted Turtle	*Chrysemys picta picta*
Wood Turtle	*Glyptemys insculpta*

Birds			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
American Black Duck	*Anas rubripes*	Hermit Thrush	*Catharus guttatus*
American Crow	*Corvus brachyrhynchos*	Herring Gull	*Larus argentatus*
American Goldfinch	*Carduelis tristis*	Least Flycatcher	*Empidonax minimus*
American Redstart	*Setophaga ruticilla*	Long-eared Owl	*Asio otus*
American Robin	*Turdus migratorius*	Killdeer	*Charadrius vociferus*
Bank Swallow	*Riparia riparia*	Mourning Dove	*Zenaida macroura*
Barred Owl	*Strix varia*	Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*
Belted Kingfisher	*Ceryle alcyon*	Northern Flicker	*Colaptes auratus*
Black-and-white Warbler	*Mniotilta varia*	Northern Goshawk	*Accipiter gentilis*
Black-capped Chickadee	*Poecile atricapilla*	Northern Oriole	*Icterus galbula*
Black-throated Green Warbler	*Dendroica virens*	Northern Parula	*Parula americana*
Blue Jay	*Cyanocitta cristata*	Ovenbird	*Seiurus aurocapillus*
Blue-headed Vireo	*Vireo solitarius*	Peregrine Falcon	*Falco peregrinus*
Bobolink	*Dolichonyx oryzivorus*	Purple Finch	*Carpodacus purpureus*
Brown Creeper	*Certhia americana*	Red-breasted Nuthatch	*Sitta canadensis*
Cedar Waxwing	*Bombycilla cedrorum*	Red-eyed Vireo	*Vireo olivaceus*
Chestnut-sided Warbler	*Dendroica pensylvanica*	Ring-necked Pheasant	*Phasianus colchicus*
Common Grackle	*Quiscalus quiscula*	Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Common Loon	*Gavia immer*	Ruffed Grouse	*Bonasa umbellus*
Common Nighthawk	*Chordeiles minor*	Rusty Blackbird	*Euphagus carolinus*
Common Raven	*Corvus corax*	Scarlet Tanager	*Piranga olivacea*
Common Yellowthroat	*Geothlypis trichas*	Short-eared Owl	*Asio flammeus*
Common Tern	*Sterna hirundo*	Song Sparrow	*Melospiza melodia*
Dark-eyed Junco	*Junco hyemalis*	Spotted Sandpiper	*Actitis macularia*
Eastern Bluebird	*Sialia sialis*	Veery	*Catharus fuscescens*
Eastern Meadowlark	*Sturnella magna*	Vesper Sparrow	*Pooecetes gramineus*
Eastern Pheobe	*Sayornis pheobe*	Yellow Warbler	*Dendroica petechia*
Eastern Wood-Pewee	*Contopus virens*	Yellow-rumped Warbler	*Dendroica coronata*

Mammals			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
American Beaver	*Castor canadensis*	Moose	*Alces alces*
American Marten	*Martes americana*	Northern Flying Squirrel	*Glaucomys sabrinus*
Common Muskrat	*Ondatra zibethicus*	Northern Long-eared Bat	*Myotis septentrionalis*
Eastern Chipmunk	*Tamias striatus*	Raccoon	*Procyon lotor*
Eastern Pipistrelle	*Pipistrellus subflavus*	Striped Skunk	*Mephitis mephitis*
Fisher	*Martes pennanti*	Southern Flying Squirrel	*Glaucomys volans*
Little Brown Bat	*Myotis lucifugus*	Varying Hare	*Lepus americanus*
Long-tailed Shrew	*Sorex dispar*	White-tailed Deer	*Odocoileus virgianus*

11.2 Appendix 2 – Definitions of "species at risk"

This Appendix contains the definitions of "species at risk" used in the three priority lists of wild species that were the basis of the priority list derived for this property: COSEWIC, the Nova Scotia Endangered Species Act and the Nova Scotia General Status of Wild Species.

11.2.1 Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

The definition for the designations used by COSEWIC are as follows:

Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)	A species for which there is insufficient scientific information to support status designation.

For further information, consult (http://www.cosewic.gc.ca/eng/sct0/index_e.cfm)

11.2.2 Nova Scotia Endangered Species Act

The definitions used for the designations under the Nova Scotia Endangered Species Act are as follows:

" "extinct species" means a species that no longer exists and is listed as an extinct species …"

" "extirpated species" means a species that no longer exists in the wild in the Province but exists in the wild outside the Province and is listed as an extirpated species …"

" "endangered species" means a species that faces imminent extinction or extirpation and is listed as an endangered species …"

" "threatened species" means a species that is likely to become endangered if the factors affecting its vulnerability are not reversed and is listed as a vulnerable species …"

" "vulnerable species" means a species of special concern due to characteristics that make it particularly sensitive to human activities and natural events and that is listed as a vulnerable species …"

For further information, consult
http://www.gov.ns.ca/legislature/legc/statutes/endspec.htm

11.2.3 General Status of Wild Species in Nova Scotia

The definitions used for the colour designations given in the General Status of Wild Species in Nova Scotia are as follows:

"**BLUE** (Extirpated/Extinct) – Species that are no longer thought to be present in the province or in Canada, or that are believed to be extinct. Extirpated species have been eliminated from a given geographic area but may occur in other areas. Extinct species are extirpated worldwide (i.e. they no longer exist anywhere). Species listed by COSEWIC as extinct or nationally extirpated automatically receive an Extirpated/Extinct general status rank. This rank applies at the national level and in whichever province or territory the species formerly existed. Nationally Extirpated/Extinct species are not considered part of Nova Scotia's species richness.

RED (At Risk or Maybe at Risk) – Species for which a formal detailed risk assessment has been completed (COSEWIC assessment or a provincial equivalent) and that have been determined to be at risk of extirpation or extinction and are therefore candidates for interim conservation action and detailed risk assessment by COSEWIC or the Province.

YELLOW (Sensitive) – Species that are not believed to be at risk of immediate extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk.

GREEN (Secure) – Species that are not believed to be at risk, or sensitive. This category includes some species that have declined in numbers but remain relatively widespread or abundant.

UNDETERMINED – Species for which insufficient data, information, or knowledge is available to reliably evaluate their status."

For further information, consult
http://www.gov.ns.ca/natr/wildlife/genstatus/background.htm

Environmental Assessment

of

Shaw Resources – Lovett Road Site

Geology, Geomorphology, Surface Water

Prepared for Shaw Resources

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2006

Summary

Shaw Resources Site

The Shaw Resources aggregate site lies within the Annapolis-Cornwallis Valley physiographic region and is characterised by moderately rolling topography and with well developed surface drainage. No bedrock outcrop is evident at the site. Ice contact stratified sand and gravel outwash deposits (kames) are presently being mined. In the core of the kames the sand and gravel has moderate to high economic utility as it is well sorted and has less than 4% silt and clay. The coarse fraction is dominated by texturally immature gravel with a high content of Carboniferous sandstone and Meguma Group slate clasts.

The site shows evidence of minor creep where the kame slopes are steep however, significant movement of sediment is not expected. A thin soil (< 15cm) overlies moderately to well sorted sand and gravel with occasional diamicton lenses. Sand and gravel thickness above the water table varies greatly, is dependent on topography, and could exceed 14m; total thickness of unconsolidated sediment could be in excess of 30 m.

Limited sampling indicated that surface water quality at the site was moderate to good. The surface water exhibits variable but near neutral pH and contains iron with minor nitrate and chloride. Surface infiltration is very rapid and storage potential is generally low due to the coarse and well sorted nature of much of the sediment. The impact of aggregate extraction on the geology, geomorphology and surface water at and around the site will be minimal. No geological or surface water VEC's were noted at the site

Geological Assessment

1.1 Climate

The Annapolis valley has the warmest temperatures and second lowest precipitation levels in the province. January temperature average around -4.0 °C whereas average July temperatures average around 21 °C. The summer months are often particularly dry and rainfall accumulations of less than 7 cm in the months of June and July are not uncommon. Total yearly snowfall accumulations average about 2.2m. The representative weather station for the Lovett Road site is located in Greenwood.

1.2 Bedrock Geology

Regional bedrock maps indicate that the Wolfville Formation sandstone underlies the sediments at the study site (Donohoe and Grantham, 1989). Based on well records, the depth of the unconsolidated sediment-Wolfville sandstone contact may be in excess of 28 m. The Wolfville Formation is a braided river deposit that consists of trough cross-bedded conglomerates and very coarse grained pebbly sandstones. This sedimentary rock commonly exhibits high primary porosity (up to 20%) but where calcite cement is common porosity can be reduced. It is a significant source of high quality groundwater in the region and is a common water source for both private and production wells regionally.

Fowler (1985) has noted on the Industrial Minerals of Nova Scotia map that the site is a prominent sand and gravel location however no other mineral deposits were identified in the vicinity. No outcrop was identified on the property.

1.3 Surficial Geology

The site is dominated by well developed ice contact stratified outwash and kame deposits that were formed during deglaciation of the study site (Figure 1, Stea et al., 1992). Ice-contact deposits are pervasive in the region; the thickness of the well sorted sand and gravel is variable but field observations indicate at least 14 m. Trescott (1967) reported that as much as 28 m of sand and gravel may exist at the site, though wells nearby record unconsolidated sediment thicknesses in excess of 30 m in length. Thicknesses are relatively consistent though they most likely diminish towards the south (Trescott 1967). Kame sediment at the site is moderately to well sorted in contrast to other deposits in the region that tend to be moderately to poorly sorted; silt and clay account for less than 6% of the sediment by volume (Figure 2). All sediment was deposited in close proximity with glacial ice and as a consequence, debris flow lenses do occur on occasion. The coarse sediment is generally moderately rounded to sub-rounded and its coarse fraction is composed primarily of locally derived rock.

Till may underlie the property but no outcrop were noted. The regional till (Lawrencetown Till) is reddish-brown, moderately-compact and massive. Cobbles and larger sized clasts account for less than 5% of the till. This sediment exhibits very low permeability and hydraulic conductivity and, as a consequence, can act as the lower confining unit of locally perched aquifers.

In this region the till and the outwash commonly overlie substantial thicknesses (> 30 m) of undifferentiated non-consolidated deposits both of glacial and interglacial origin. These

deposits may comprise till, gravel, sand, and possibly soils and though probably highly anisotropic may form both locally and regionally significant aquifers due to the extremely high porosity and hydraulic conductivity of the gravel units (Trescott 1967). Unfortunately, the distribution and thickness of these sediments is speculative, their presence is only inferred through the interpretation of drill logs, observation of available outcrop, and comparison to nearby deposits. It is likely that the overall thickness of unconsolidated sediment thins to the east and the north of the study site.

1.4 Geomorphology

The Lovett Road aggregate site is located on the southern side of the east-west trending Annapolis Valley. The site proper is characterized by gently-rolling to vigorously rolling topography with about 12 m maximum topography (Roland 1982). There are no active surface drainage corridors in the study site however, a secondary (ephemeral) corridor does exists to the east of the study area; flowing water was not observed. No natural lakes or ponds are evident on the property.

1.5 Sediment stability

Local surface slopes at the site are generally lest than 20°. At a few sites slopes can reach 25° most notably east of the site boundary in the vicinity of WS-1 and 2 (Figure 4) where the eastern edge of the kame comes in contact with a secondary drainage corridor. There was some evidence of sediment creep at this site, as indicated by the accumulation of soil on the upslope side of the trees. As well, the trunks of older trees often exhibit a subtle curvature characteristic of surface creep. Creep appears to be most active along the eastern edge of the property. Some surface deflation was apparent at recently disturbed sites, especially where the underlying outwash sediment is finer grained. Some erosion has occurred where ATV paths are located.

1.6 Soils and Peat

The Shaw Resources Lovett Road site is covered entirely by the Cornwallis soil which is composed of water deposited, loose, weakly stratified yellowish red sands and gravels (Cann et al., 1954; Cann and MacDougall, 1965). Locally, an iron/manganese cement and sediment surface coating is evident and may impede surface water infiltration (Figure 3). The Cornwallis soil is excessively drained, is developed on low to undulating land, and is generally stone free. The soil at the site has been classified as having Class 4 capability

indicating that it has severe limitations that restrict the range of crops that can be grown on them. In general Class 4 soils are low to fair in productivity and are very susceptible to drought. For the above reasons soil at the site is considered as poor crop land. There are no significant peat deposits in the study region (Anderson and Broughm, 1986).

Surface Water

2.0 Surface Water

The hilly "kame and kettle" topography typical of kame fields is quite evident at the study site (Trenhaile 1998). Local relief can be up to 15 m and slopes of up to 25° were observed. Though overland flow might be expected under these conditions, the very high permeability of the Cornwallis soils result in almost all precipitation entering the ground water system as through flow. Ground water flow in the vadose zone is almost always vertical as sediments at the site display weak anisotropy. Though significant local topography exists at the site, ponded and running water are virtually absent though 4 days of steady rain preceded site investigation. The bottom of the pit (water sample site WS-4; Figure 4) was saturated and excavation to a depth of 70cm with a power auger indicated saturated conditions below the pit floor. It is likely that the base of the pit during times of recharge represents the upper surface of a locally perched water table. Downward flow may be impeded by silt and clay layers which become more common in outwash and kames at depth. Standing water was also observed in the lowest lying interfluves (between kame crests, site WS-3, Figure 4) and at the eastern edge of the kame (WS-1, WS-2; Figure 5). The water was derived from seepage of pore water (and perhaps a locally perched water table) that developed as a consequence of almost 4 days of steady rain.

Two Guelph Permeameter tests were conducted on the sides of the kames to quantify the field saturated conductivity of the soils (see Figure 4). The Guelph Permeameter is an instrument that quantifies the ability of precipitation to infiltrate a soil (field saturated conductivity). Results from the two test sites are as follows:

- GP-1: 0.025 cm/sec
- GP-2: 0.021 cm/sec

The Guelph Permeameter data indicates that the soil is moderately permeable, much more so than other soils in the Annapolis Valley which typically produce conductivity results that are an order of magnitude lower. (K. Belliveau, GSC Annapolis Valley Study).

Trescott (1967) noted that a well located about 1 km north of the study site penetrated 18 m of saturated aggregate indicating that significant amounts of groundwater can be stored in the unconsolidated Quaternary sediment. It is likely that the orientation of the water table follows local topography and that the groundwater gradient is towards the east – northeast.

2.2 Surface Water Chemistry

Assessment of surface water chemistry took place on June 11, 2006 at variety of surface seeps located along the periphery of the site as no running water courses are found on or near the property (see Figure 4, Table 1). The water samples were analysed for a specific suite of common water quality indicators including pH , conductivity, iron, phosphate, and nitrate as NO_3-N. These analyses were performed using a YSI water quality meter as well as a Hach DR 800 Colorimeter. A summary of the surface water chemistry is displayed in Table 1. The water chemistry data indicates moderate to good surface water quality at sites 1 - 3 (Canadian Drinking Water Standards, 1998). Nitrate is at or near background levels and slightly elevated chloride and conductivity may reflect the use of road salt on Highway 101 located just north of the study site. pH is near neutral and may reflect the relatively young age of the water. Iron concentrations are somewhat high and are associated with the many sources of iron in both the fine and coarse grained fractions of the kame sediment.

Site	pH	Iron	Cond. (µS/cm)	Nitrate NO_3-N	Chloride
WS-1	6.35	1.42	11	0.05	2.0
WS-2	6.48	4.7	33	0.05	12.0
WS-3	7.29	3.4	38	0.01	10.0
WS-4	6.71	1.9	16	0.02	0.5

Table1. Surface water chemistry results for sites indicated on Figure 1. All measurements are in mg/L (ppm). Water samples were taken after 4 days of moderate to heavy rain.

Water Sample Descriptions:

- Water Sample 1 (WS-1, Figure 4): a groundwater seep sample taken at the eastern end of the property where there is a pronounced break in slope between the kame and a minor drainage corridor. Sample was clear, water was stagnant.
- Water Sample 2 (WS-2, Figure 4): a groundwater seep sample taken at the northeastern end of the property where there is a break in slope between the kame sediments and a minor drainage corridor. Some discolouration of water was evident.
- Water Sample 3 (WS-3, Figure 4): A ponded water sample taken at the base of a slash pile on the northern edge of the property. Water source is the elevated kame sands and gravels.
- Water Sample 4 (WS-4, Figure 4): A ponded water sample taken on the floor of the pit located to the east of the study area. The sample was taken at the base of the main excavation.

3.0 Impacts

3.1 Impact of Aggregate Extraction on Geology and Geomorphology

There is no indication that excavation at the site will result in exposure to bedrock. Though no direct data exists, nearby wells indicate that bedrock is between 20m and 40m below the floor of the present excavation and is most likely located below the water table. No evidence was observed that appreciable mass wasting has occurred in the past or will occur as a result of the proposed development. As well, given the high permeability of the sediment at the site, it is unlikely that the proposed excavation will result in exposure of groundwater resources

3.2 Impact of Aggregate Extraction on Surface water

In my opinion there will be very little impact on the quantity or quality of surface water entering in to the groundwater system as a result of excavation. The aggregate exposed in pit faces is consistently well sorted with little silt or clay. Both rain and snowmelt will infiltrate quickly through the vadose zone, replenishment of the water table would be rapid. Removal of aggregate will accelerate transfer of input to the water table but as the permeability is so great, this will be negligible. It should be noted that any contamination of

the site will quickly be transferred to the groundwater table. It is not expected that excavation will greatly accelerate this process.

3.3 Valued Ecological Components (VEC)

From a geological and surface water perspective, no VEC's were identified at this site.

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Figures:

Figure 1: Photograph from crest of pit showing the shallow to moderate undulations typical of the study site and common in the Kentville to Kingston corridor.

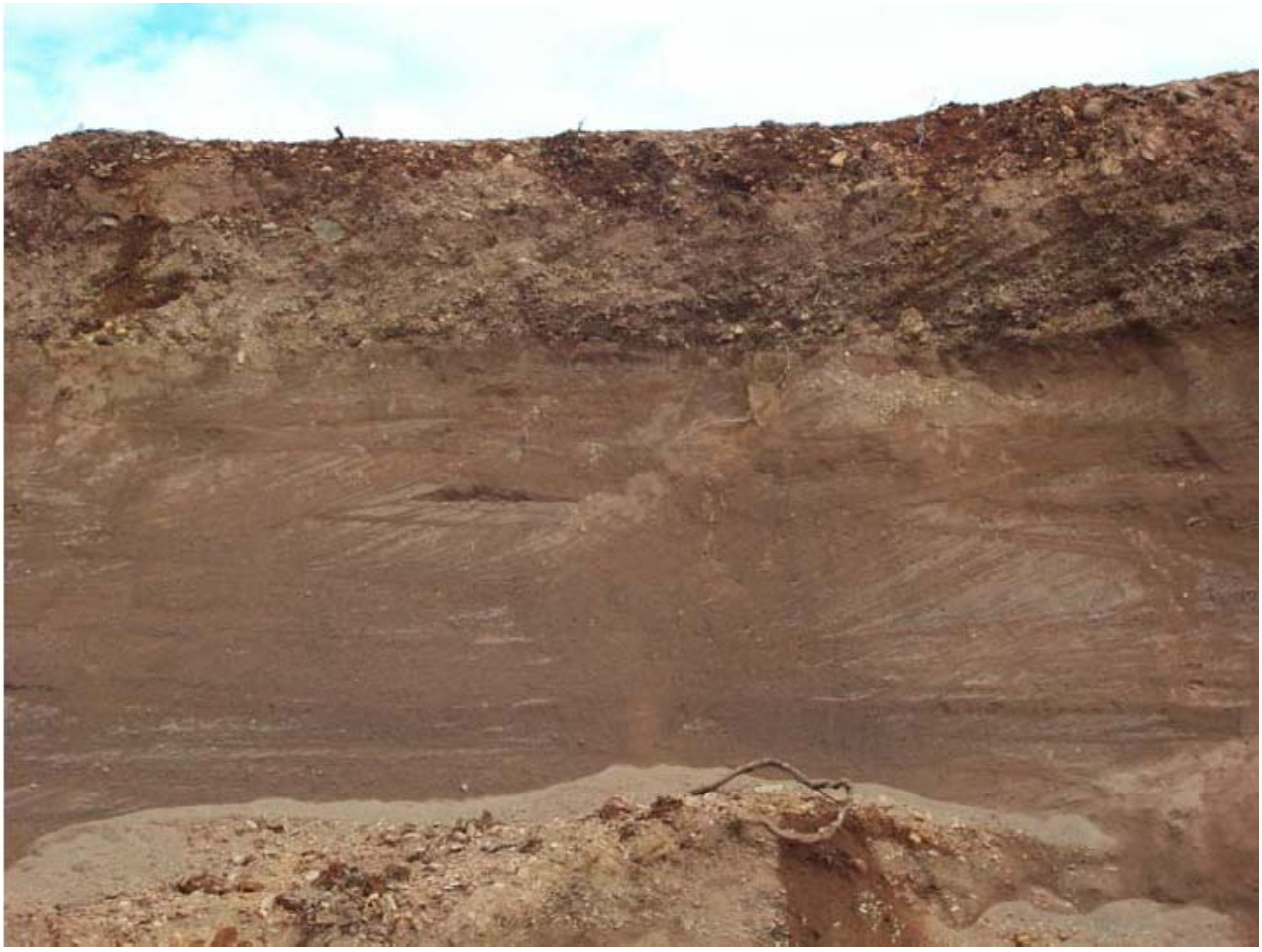

Figure 2: Medium to coarse well sorted sand and gravel exposed in the actively worked face of the pit. The lower sediment is primarily trough cross stratified medium sand which is overlain by coarse moderately to poorly sorted gravel with occasional diamicton lenses. This coarsening upwards sediment succession is common in ice contact subaqueous settings.

Figure 3: Weakly developed iron cementation is common near the sediment-soil boundary. The cement is most likely hematite though limonite might also be present. The source of the iron is likely both the Meguma Group slates and the Carboniferous sandstones as clasts from each are common in the coarse fraction. The high iron content of the sediment is also evident in the chemistry of the water samples.

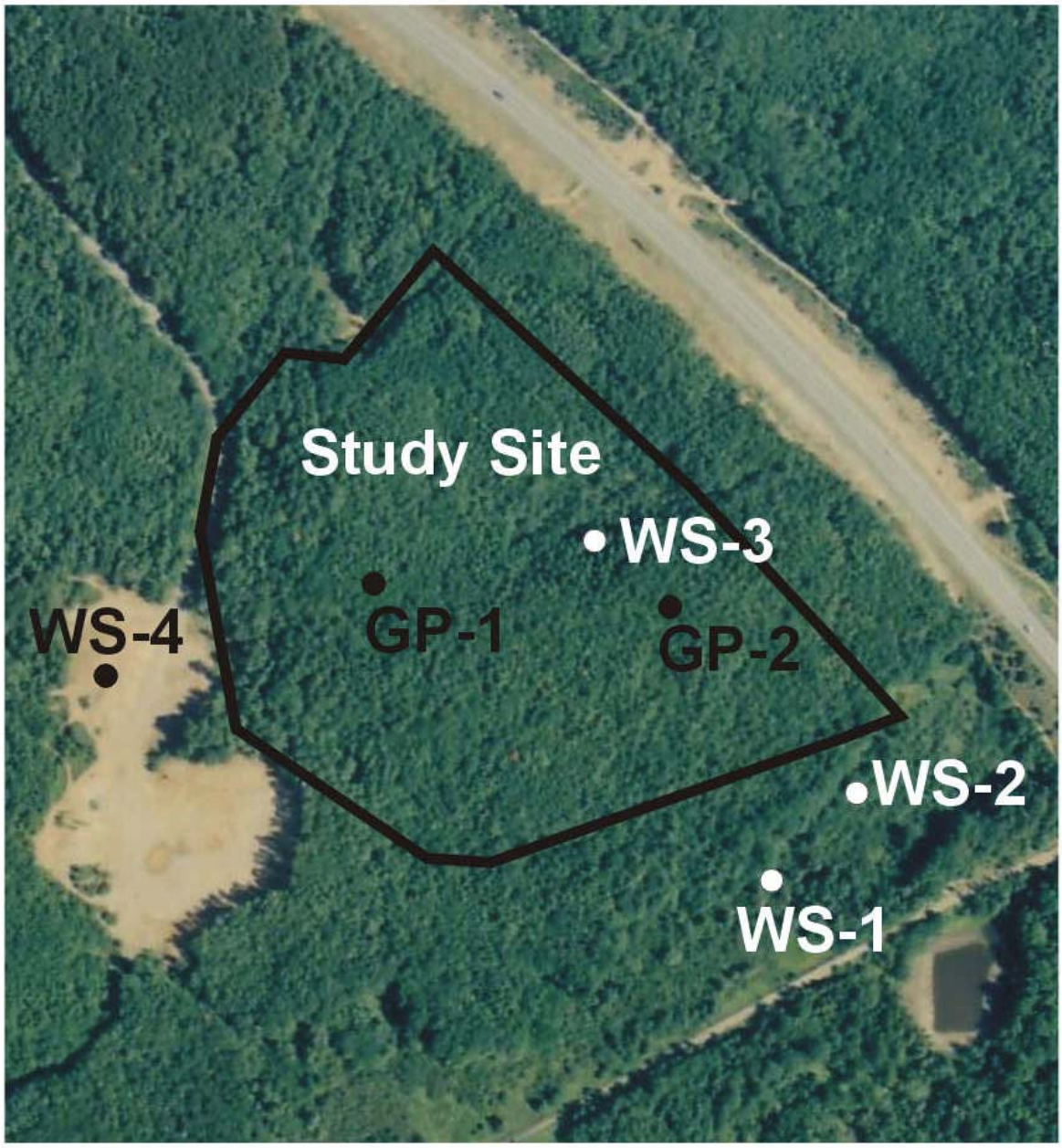

Figure 4: Study site with water sample site (WS-1 to4) and Guelph Permeameter locations (GP1 and GP-2). Photo was taken before excavation had commenced at the site.

Figure 5: Standing water at the edge of the kame deposit. Water sample #1 was taken from this site. This water was evident after 4 days of continuous rain and probably represents seep from a locally elevated water table that developed within the kame deposit.

Appendix IX: Archaeological and Heritage Study

Environmental Assessment

of

Shaw Resources – Lovett Road Site

Archaeological and Heritage Resources

Prepared for Shaw Resources

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1.1 Introduction

This report describes the findings of a Phase 1 archaeological assessment of a proposed expansion of an existing sand pit in Coldbrook, Nova Scotia. It was concluded that the study area did not contain significant archaeological resources, precluding the need for any fieldwork, and it was recommended that the project proceed as planned.

1.2 Project Description

The project is an expansion of an existing sand pit operation operated by Shaw Resources (Figs 1 to 3). The existing sand pit is 1.7611 hectares in area and it is proposed to expand it to 3.9857 hectares. The study area (SA) is bounded by Highway 101 to the north, the former Dominion Atlantic Railway to the south, and a subdivision to the west. There are several roads and tracks running through the area, but for the most part it is forested. The Cornwallis River is located to the west but well outside of the SA and there is a small lake even further to the west.

1.3 Background Research

The Annapolis Valley has a long and rich history beginning with the thousands of years of Mi'kmaq occupation to the various phases of European occupation, including the French, Acadian, Planters, and Loyalists. However, nothing was found during the background research to suggest any significant settlement within the study area.

The early maps show Acadian settlement growing from the Minas Basin west towards Annapolis Royal, but these would have been based around rivers and salt marshes. The expulsion of the Acadians in 1755 opened the door for the Planters in the 1760s who took over and expanded the former Acadian territory. The final influx of immigrants to the area was the Loyalists after 1783, although their numbers were more significant in other areas of what was then Nova Scotia, including Shelburne and Saint John. The nineteenth century saw the growth of towns like Kentville and smaller villages like Coldbrook. However, the A.F. Church map of 1872 shows nothing built within the study area, which was located in what was then called Cold Brook Station (Fig 4).

Historic aerial photographs were examined in the Department of Natural Resources library. The first set was taken in 1931 and show the SA to be almost completely cleared with some

apparent cultivation along the former railway bed. There is no evidence of settlement features in the area apart from a few tracks or paths. The 1955 aerials show more vegetation than in 1931but it is still relatively open. Again, apart from some light land-use like trails and paths, there are no settlement features evident in this photo. By 2002 the SA was almost completely covered with mature trees with only the road to the sand pit and a few paths visible.

1.4 Recorded Archaeological Sites

There are no recorded archaeological sites within the SA.

1.5 Archaeological Potential

First Nations

The study area contains very few resources that would have attracted settlement by First Nations peoples in the past. The nearest water source is Cornwallis River located to the west and well outside of the SA and it is also unlikely that this area was used as a portage route. It was concluded that this area had no resources to attract First Nations settlement and the First Nation's archaeological potential should be considered low.

Historic

The background research shows that there was no historic settlement within the study area and its historic archaeological potential should be considered low.

1.6 Fieldwork

The background research shows the archaeological potential of the SA to be low and it was concluded that there was no requirement for any for of field visit.

1.7 Conclusion and Recommendations

The background research shows that there are no recorded First Nations or historic archaeological sites within the study area and that the potential for the SA containing such sites is considered to be low. It is recommended that the project proceed as planned without the need for further archaeological work.